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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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UNITED STATES DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
ALEXANDRIA, VA 22304

EXAMINER

ART UNIT

PAPER NUMBER

DATE MAILED:

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/123,352

Applicant(s)
Yunlong et al

Examiner
Rudy Zervigon

Art Unit
1763



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Feb 26, 2001
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1035 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirements.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d)
- a) ☒ All b) ☐ Some* c) ☐ None of
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- *See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 18) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other _____

Art Unit: 1763

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 1-8 and 16-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato Noriyoshi et al (JP5-354023 IDS reference). Sato Noriyoshi et al describes an apparatus for plasma assisted operations (abstract). Specifically, Sato Noriyoshi et al describes a plasma generation chamber with the following attributes:
 - i. A plasma generation apparatus vacuum vessel (Abstract, purpose) having a plasma generation region formed from a gas inductor (item 8, Figures 1, 3, 5-6, 8) that inducts discharge gas established in the interior thereof (abstract)
 - ii. An exhaust (piping from vacuum chamber (item 1, all figures) to "evacuation mechanism", abstract item 7) that exhausts the atmosphere in the interior of the vacuum vessel (item 7, abstract)
 - iii. A tube-shaped discharge electrode (item 9, Figure 5) fashioned to enclose the plasma generation region
 - iv. A first high frequency electric power applicator (item 19; "electrode supply mechanisms 10, 11, 12 for supplying power to the discharge electrode...", abstract) that applies high-frequency electric power to the tube-shaped discharge electrode (item 9, Figure 5) fashioned to enclose the plasma volume

Art Unit: 1763

- v. A second high frequency electric power applicator (item 77, Figure 7), with resonant circuit (78, figure 7), that applies high-frequency electric power to one (item 72, figure 7) of two walls (items 5, 1; figure 1) fashioned to enclose the plasma volume
- vi. Magnetic force line generator that generates (items 401,402 Figure 5; abstract) magnetic force lines (501-503, figures 1, 2) being capable of trapping electrons having portions (at the surface of item 1, Figures 1,2) roughly parallel to the center axis of the tube-shaped discharge electrode fashioned to enclose the plasma volume such that the length of the parallel portions become longer (less curved) the closer the magnetic force lines are to the central axis of the tube-shaped discharge electrode fashioned to enclose the plasma volume (Figure 5)
- vii. The magnetic force line generator is constructed so as to form the magnetic force line between the one of the two walls (items 5, 1; figure 1,4) and the objects (6, Figure 4) to be treated held by the other (5, Figure 4) of the two walls
- viii. The magnetic force line generator comprises two ring shaped magnets (401, 402; Fig.4) fashioned so as to enclose the plasma generation region and to spaced at a prescribed distance apart from each other in the direction of "center axis of the discharge electrode
- ix. Electrically conducting two walls (items 5, 1; figure 1) positioned so as to "sandwich" the plasma generation region, and substrate (item 4, all Figures), between them in the dimension of the center axis of the tube-shaped discharge electrode (item 9, figure 5) fashioned to enclose the plasma volume for defining the scope of the plasma generation region in the center axial dimension

Art Unit: 1763

- x. The other of two walls (item 1, Figure 5) connected to a reference potential
- xi. The other of two walls (item 5, Figure 5) is established in a floating state and used as a holder for holding the object (6, Figure 5) to be treated
- xii. The magnetic force lines fashioned to enclose the plasma volume such that the length of the parallel portions become longer (less curved) the closer the magnetic force lines are to the central axis of the tube-shaped discharge electrode (item 9, Figure 5) fashioned to enclose the plasma volume passing through a center of the plasma generation region.
- xiii. magnetic field lines so shaped (Figures 1,2) as not to intersect the electrically conducting two walls (items 5, 1; figure 1) positioned so as to "sandwich" the plasma generation region between them in the dimension of the center axis of the tube-shaped discharge electrode fashioned to enclose the plasma volume for defining the scope of the plasma generation region in the center axial dimension

Claim Rejections - 35 USC § 103

- 3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
- 4. Claim 9 is rejected under 35 U.S.C. 103(a) as being obvious over Sato Noriyoshi et al (JP5-354023 IDS reference). Sato Noriyoshi et al does not explicitly describe:
 - xiv. Both of the two walls (items 5, 1; Figure 5) connected to a reference potential

Art Unit: 1763

A person of ordinary skill in the art at the time the invention was made would find it obvious to change the potential applied to the confining plasma surfaces. Motivation is drawn from varying the plasma volume geometry and impinging energy of the ions resulting in higher quality films. The obviousness of process parameter (voltage in this instance) variations is supported:

5.

CAUSE EFFECTIVE VARIABLES

It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

CAUSE EFFECTIVE VARIABLES - Routine experimentation

It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as [spray droplet size] through routine experimentation in the absence of a showing of criticality in the claimed size. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, USPQ 233 (CCPA 1955).

Art Unit: 1763

CRITICALITY OF PROCESSING PARAMETERS

If Applicant can establish a showing of criticality in the claimed pressure, the rejection will be withdrawn. See *Ex parte Khusid*, 174 USPQ 59 ("Where the principal difference between the claimed process and that taught by the reference is a temperature difference, it is incumbent upon Applicant to establish criticality of that difference"). This decision is clearly analogous to pressure differences and other process parameters.

6. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-9, 16-18 above, and further in view of Kinoshita et al. Sato Noriyoshi et al does not describe
- xv. A controller that controls the magnitude of high frequency electric power applied to the discharge electrode from the high frequency electric power supply
 - xvi. A controller that controls the magnitude of high frequency electric power output from the first and second high frequency electric power supplies
 - xvii. A controller configured so that the ratio of the magnitude of high frequency electric power output from the first and second high frequency electric power supplies is a predetermined value
- Kinoshita et al describes

Art Unit: 1763

- xviii. A controller (27, column 14, lines 12-18, 25-29) that controls the magnitude of high frequency electric power applied to discharge electrode (21, 22, column 14, lines 12-18, 25-29) from the high frequency electric power supply
- xix. A controller (27, column 14, lines 12-18, 25-29) that controls the magnitude of high frequency electric power output from the first (item 16, Figure 7; column 9, lines 45-50) and second (item 26, Figure 7; column 9, lines 45-50) high frequency electric power supplies
- xx. A controller configured so that the ratio of the magnitude of high frequency electric power output from the first and second high frequency electric power supplies is a predetermined value (column 12, lines 43-67)

A person of ordinary skill in the art at the time the invention was made would find it obvious to consider Kinoshita et al's reference potential points to be an obvious extension of the Sato Noriyoshi et al (JP5-354023 IDS reference) apparatus. Motivation for combining the above references is drawn to sustaining, according to Kinoshita et al, "plasma uniformities" (column 12, lines 43-67).

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-8, 16-18 above, and further in view of Smesny et al (U.S.Pat. 5,444,637). Sato Noriyoshi et al does not specifically address position adjustment means for adjusting positions of plasma confining walls. Smesny et al describes an integrated circuit dry etch chamber (item 90, Figure 5; column 12, lines 11-28). Specifically, Smesny et al describe

Art Unit: 1763

a *position adjustment means for adjusting positions of* a movable first *electrically conductive wall electrode* (item 92, Figure 5; column 12, lines 10-15).

A person of ordinary skill in the art at the time the invention was made would find it obvious to implement the enhancements of position adjustment means for adjusting positions of plasma confining walls as taught by Smesny et al to the Sato Noriyoshi et al apparatus. Motivation is directed, according to Smesny et al, for optimal etching conditions (Column 12, lines 50-55).

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-8, 16-18 above, and further in view of Inazawa et al (U.S.Pat. 5,595,627). Sato Noriyoshi et al does not precisely describe a wall functioning as a gas diffusion plate. Inazawa et al describe the *upper first electrically conductive wall electrode 40* has a hollow interior, and a large number of gas diffusion holes 42 are formed in its entire surface opposite to the wafer W. a dispensing plate (not shown) is disposed in the *upper first electrically conductive wall electrode 40*. An etching gas fed into the *upper first electrically conductive wall electrode 40* through a gas feed pipe 44 is uniformly sprayed into the processing chamber 16 through the gas diffusion holes 42 (column 4, lines 56-65).

A person of ordinary skill in the art at the time the invention was made would find it obvious to consider the wall functioning as a gas diffusion plate as taught by Inazawa et al to be an obvious

Art Unit: 1763

improvement over the Sato Noriyoshi et al plasma reactor. Motivation for combining the above references is drawn from the added advantage of evenly distributing the process gas, as opposed to the Sato Noriyoshi et al introduction method (all Figures), introduced into the process chamber over the entire length of the reactor volume as is commonly accomplished when using shower head gas distributors. Support for the motivation is provided:

2144.03 Reliance on Common Knowledge in the Art or "Well Known" Prior Art [R - 1]

>The rationale supporting an obviousness rejection may be based on common knowledge in the art or "well - known" prior art. The examiner may take official notice of facts outside of the record which are capable of instant and unquestionable demonstration as being "well - known" in the art. In re Ahlert , 424 F.2d 1088, 165 USPQ 418, 420 (CCPA 1970) (Board properly took judicial notice that "it is common practice to postheat a weld after the welding operation is completed" and that "it is old to adjust the intensity of a flame in accordance with the heat requirements."). See also In re Seifreid , 407 F.2d 897, 160 USPQ 804 (CCPA 1969) (Examiner's statement that polyethylene terephthalate films are commonly known to be shrinkable is a statement of common knowledge in the art, supported by the references of record.).

Response to Arguments

9. Applicant's arguments with respect to "The plasma generated by the device of Noriyoshi is generated in the periphery of the plasma generation region and then diffuses to the center

Art Unit: 1763

region. Conversely, the plasma generating apparatus of claims 1 and 17 of the instant invention have magnetic force line generators that generate high density plasma in the center as well as the periphery." is not persuasive because apparatus claims must distinguish structurally. The following decision may support this position:

10.MPEP - 2114

Apparatus and Article Claims - Functional Language [R - 1]

APPARATUS CLAIMS MUST BE STRUCTURALLY DISTINGUISHABLE FROM THE PRIOR ART

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danley, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does ."(emphasis in original) Hewlett - Packard Co . v. Bausch & Lomb Inc ., 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

11. Applicant's arguments with respect to "However, it is not disclosed that high frequency electric power is applied to the substrate holding mechanism, and thus the substrate holding mechanism does not function as does the two walls structure in the claimed invention." - It is noted in this and the prior action that Noriyoshi teaches an embodiment whereby:

xxi. A second high frequency electric power applicator (item 77, Figure 7), with resonant circuit (78, figure 7), that applies high-frequency electric power to one (item 72, figure 7) of two walls (items 5, 1; figure 1) fashioned to enclose the plasma volume

Art Unit: 1763

12. In response to applicant's argument that there is no suggestion to combine the references in rejecting claim 9, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). Applicant's position regarding claim 9 that "there was no motivation to arrive at the claimed invention from the teachings of Noriyoshi et al nor was there any common knowledge to those of skill in the art...." - In this and the prior action motivation for combining the references of record to reject claim 9 are stated. In this case, there is established teaching, suggestion, and motivation to change the potential applied to the surfaces confining the plasma. The teaching, suggestion, and motivation is found, in combination, with the references and in the knowledge generally available to one of ordinary skill in the art -

A person of ordinary skill in the art at the time the invention was made would find it obvious to change the potential applied to the confining plasma surfaces. Motivation is drawn from varying the plasma volume geometry and impinging energy of the ions resulting in higher quality films. As demonstrated by Noriyoshi et al, the common practice of magnetic field confinement (MFC) as shown by nearly all figures works to "...generate its plasma at a low pressure and reduce its energy for projecting ions on a substrate to be processed." (Purpose). The obviousness of process parameter (voltage in this instance) variations supports the rejection:

Art Unit: 1763

CAUSE EFFECTIVE VARIABLES

It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. In re Boesch, 205 USPQ 215 (CCPA 1980).

CAUSE EFFECTIVE VARIABLES - Routine experimentation

It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as [spray droplet size] through routine experimentation in the absence of a showing of criticality in the claimed size. In re Woodruff, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. In re Aller, USPQ 233 (CCPA 1955).

CRITICALITY OF PROCESSING PARAMETERS

If Applicant can establish a showing of criticality in the claimed pressure, the rejection will be withdrawn. See Ex parte Khusid, 174 USPQ 59 ("Where the principal difference between the claimed process and that taught by the reference is a temperature difference, it is incumbent upon Applicant to establish criticality of that difference"). This decision is clearly analogous to pressure differences and other process parameters.

Art Unit: 1763

13. In response to applicant's argument that there is no suggestion to combine Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-9, 16-18 above, and further in view of Kinoshita et al in rejecting Claims 10-13, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, there is some teaching, suggestion, and motivation to consider Kinoshita et al's reference potential points to be an obvious extension of the Sato Noriyoshi et al (JP5-354023 IDS reference) apparatus and, as such, is found in the references themselves and in the knowledge generally available to one of ordinary skill in the art.

Motivation for combining the above references is drawn to sustaining, according to Kinoshita et al, "plasma uniformities" (column 12, lines 43-67).

14. In response to applicant's argument that there is no suggestion to combine Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-8, 16-18 above, and further in view of Smesny et al (U.S.Pat. 5,444,637) in rejecting Claim 14, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21

Art Unit: 1763

USPQ2d 1941 (Fed. Cir. 1992). In this case, there is some teaching, suggestion, and motivation to implement the enhancements of position adjustment means for adjusting positions of plasma confining walls as taught by Smesny et al to the Sato Noriyoshi et al apparatus. Motivation is directed, according to Smesny et al, for optimal etching conditions (Column 12, lines 50-55).

15. In response to applicant's argument that there is no suggestion to combine Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-8, 16-18 above, and further in view of Inazawa et al (U.S.Pat. 5,595,627) in rejecting Claim 15, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, there is some teaching, suggestion, and motivation in the knowledge generally available to one of ordinary skill in the art to consider the wall functioning as a gas diffusion plate as taught by Inazawa et al to be an obvious improvement over the Sato Noriyoshi et al plasma reactor. Motivation for combining the above references is drawn from the added advantage of evenly distributing the process gas, as opposed to the Sato Noriyoshi et al introduction method (all Figures), introduced into the process chamber over the entire length of the reactor volume as is commonly accomplished when using shower head gas distributors. Additional support for the motivation is provided:

2144.03 Reliance on Common Knowledge in the Art or "Well Known" Prior Art [R - 1]

Art Unit: 1763

>The rationale supporting an obviousness rejection may be based on common knowledge in the art or "well - known" prior art. The examiner may take official notice of facts outside of the record which are capable of instant and unquestionable demonstration as being "well - known" in the art. In re Ahlert , 424 F.2d 1088, 165 USPQ 418, 420 (CCPA 1970) (Board properly took judicial notice that "it is common practice to postheat a weld after the welding operation is completed" and that "it is old to adjust the intensity of a flame in accordance with the heat requirements."). See also In re Seifreid , 407 F.2d 897, 160 USPQ 804 (CCPA 1969) (Examiner's statement that polyethylene terephthalate films are commonly known to be shrinkable is a statement of common knowledge in the art, supported by the references of record.).

Art Unit: 1763

Conclusion

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 305-3599. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached then please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.